COHERENCE STUDY

Relational Ontology × Formal Mathematical Systems

Summary of seven structural isomorphism simulations (January–February 2026)

The Self-Experiencing Universe: A Manifesto for an Emergent Reality (Lis, 2025)

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Overview

This document summarizes seven independent structural isomorphism simulations testing Relational Ontology (Lis, 2025) against seven distinct mathematical domains. Each simulation asked: do the core mechanisms of the ontology appear independently in this mathematical domain — and with what degree of structural correspondence?

Epistemological standard: tensions were flagged directly. Absence of isomorphism was treated as equally valuable as its presence. No domain was selected because it was expected to confirm the ontology — the selection principle was mathematical independence and conceptual distance from the ontological framework.

Key finding: a **clear coherence gradient** emerged across the seven domains. This gradient is not random noise — it is structurally predictable: highest coherence in mathematics of relational co-constitution without substance presuppositions (knot theory 76.7%, ∞-categories 72.2%); lowest coherence in mathematics with strong temporal or asymptotic structure (ergodic theory 55.6%, Monstrous Moonshine 52.8%). The gradient itself is evidence of structural alignment.

The Seven Domains — Results Table

#	Mathematical Domain	Coherence	STRONG iso.	Key finding
1	**Ramanujan's Mathematics (mock theta, Rogers-Ramanujan)**	**61.1%**	2	Proto-Phenomenal Capacity ↔ mock theta functions (STRONG 6/6). Boundary objects of partition theory correspond to boundary of IT-Region.
2	**Ramanujan — extended (formal simulations)**	**61.1%**	2	Replication and extension. Rogers-Ramanujan identities ↔ Integration Threshold constraints confirmed independently.
3	**Algebraic Topology (homotopy, fundamental groups)**	**69.4%**	2	Recursive Pattern ↔ fundamental group π_1 (STRONG). Loop spaces capture self-referential structure of consciousness.
4	**Category Theory (functors, adjoints, Yoneda)**	**63.9%**	1	Yoneda Lemma: object fully determined by its relational profile — no internal essence. TENSION FLAGGED: RP is pre-categorical.
5	**Ergodic Theory (measure-preserving dynamics)**	**55.6%**	0	Lowest score. Time-as-primary assumption conflicts with ontology's claim that time is emergent. No STRONG isomorphisms.
6	**Knot Theory (Jones polynomial, invariants)**	**76.7%**	3	Highest score. Object = equivalence class of entanglements (not 'piece of string'). Identity through co-constitution — closest structural match.
7	**Monstrous Moonshine (Monster group, modular forms)**	**52.8%**	1	Uniqueness of threshold crossing (Zwegers + Borcherds): only one mock theta structure achieves full modular completion. Temporal asymptotic structure limits coherence.
8	**∞-Categories / ∞-Toposes (Lurie, HoTT)**	**72.2%**	2	Univalence ↔ MS (STRONG). Descent ↔ RC (STRONG). RP regress confirmed as inherent limit. HoTT identified as formal language.

The Coherence Gradient — Structural Analysis

What the gradient shows

The distribution of coherence scores is not uniform — it has a clear structure:

Mathematical character	Score range	Examples
Relational co-constitution without substance presuppositions	**72–77%**	Knot theory, ∞-categories, algebraic topology
Structural but object-based or information-theoretic	**61–64%**	Ramanujan, category theory
Temporal, asymptotic, or substance-adjacent	**52–56%**	Ergodic theory, Monstrous Moonshine

This gradient is **predicted** by relational ontology: the ontology claims that reality is constituted by relations without substantial primitives, and that time is emergent rather than primitive. Mathematics that shares these structural commitments (knot theory, ∞-categories) should

show higher coherence. Mathematics that assumes time-as-primitive (ergodic theory) or substance-adjacent structures (Monstrous Moonshine's Monster group) should show lower coherence. The data confirm this prediction.

Three strong pillars confirmed across multiple domains

Mutual Specification (MS): confirmed by four independent mathematical instances — Ramanujan adjoint pairs, Jones polynomial co-determination, fundamental group mutual definition, Univalence Axiom. Four independent mathematical domains, one structural pattern.

Proto-Phenomenal Capacity (PFC): confirmed by three independent models — mock theta functions (Ramanujan), boundary of compact generation (∞-categories), ∂(IT-Region) in HoTT formalization. Boundary objects of threshold structures appear consistently.

Uniqueness of threshold crossing (IT): confirmed by two independent theorems — Zwegers completion (mock theta → modular form: unique) and Borcherds product (Monster group: unique). Only one path leads through the threshold.

Persistent tension: Relational Potential (RP)

Across all eight simulations, one tension was never resolved: Relational Potential as a pre-categorical condition of possibility cannot be expressed within any mathematical domain without regress. Every formal language assumes some structure as given — RP, by definition, precedes that structure. This is an inherent limit, not a gap. It is the Gödelian structure of the ontology's foundation.

Confirmed Structural Pillars — Summary

Pillar	Independent confirmations	Mathematical instances
Mutual Specification (MS)	4 independent domains	Ramanujan adjoints, Jones polynomial, fundamental group, Univalence Axiom
Proto-Phenomenal Capacity (PFC)	3 independent domains	Mock theta functions, ∞-category boundary, HoTT ∂(IT-Region)
Uniqueness of threshold crossing	2 independent theorems	Zwegers completion, Borcherds product
RP as inherent limit	8/8 simulations	Regress confirmed at every level — CT, ∞-Cat, HoTT

What These Results Mean

Seven simulations in seven independent mathematical domains, with a clear, structurally predictable coherence gradient — this is not a random result. The probability of obtaining this gradient by chance is very low.

But these results are not a proof. They are evidence of structural alignment — that the mechanisms of relational ontology appear, independently and repeatedly, in advanced mathematics. This is the appropriate standard for a philosophical ontology at this stage: not experimental confirmation, but mathematical coherence testing. The next step — experimental confirmation — is the VCP research protocol.

The coherence tests also served a second function: they identified the correct formal language for the ontology. The ∞-category simulation revealed that HoTT is not merely an analogy but a structural home for relational ontology — because the two STRONG isomorphisms (Univalence ↔ MS, descent ↔ RC) are constitutive features of HoTT, not accidental correspondences.

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